

EFFECTS OF ORGANOCHLORINE RESIDUES
ON THE WHITETHROAT
SYLVIA COMMUNIS LATH.

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Department of Animal Ecology
University of Lund, Sweden

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av

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Akademisk avhandling som för avläggande av filosofie doktorsexamen vid matematisk-naturvetenskapliga fakulteten vid universitetet i Lund kommer att offentligen försvaras å Ekologihuset, Helgonav. 5, Lund, fredagen den 7 december 1973 klockan 09.00.



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The thesis is a summary of the following papers:

- I. Habitat selection and nesting of a South Swedish whitethroat *Sylvia communis* Lath. population. - *Ornis scand.* 2: 119-126, 1971.
- II. Chlorinated hydrocarbons and reproduction of a South Swedish population of whitethroat *Sylvia communis*. - *Oikos* 22: 248-255, 1971.
- III. Uptake of chlorinated hydrocarbons by whitethroats *Sylvia communis* Lath. in areas sprayed with DDT. - *Ornis scand.* 2: 127-135, 1971.
- IV. Effects of DDT administration on juvenile and adult white-throats. - *Oikos* in press.
- V. Degradation and seasonal variation of DDT in whitethroats *Sylvia communis*. - *Oikos* in press

These papers will be referred to by the above Roman numerals.

INTRODUCTION

Many birds have died from insecticides used for agricultural purposes. However, little is known about the effects of nonlethal levels of insecticides on the ability of wild birds to complete a normal breeding cycle. This problem was examined in a population of whitethroats Sylvia communis Lath. in southern Sweden.

BREEDING BIOLOGY OF THE WHITETHROAT

The breeding biology of the whitethroat previously had been only superficially studied. As a basis for the study of chlorinated hydrocarbons as an environmental constituent of a whitethroat population in South Sweden it was therefore necessary to start with an investigation of certain features of its general breeding biology.

Apart from a general preference for open areas with scattered bushes the following properties serve as key factors for the habitat selection of the whitethroats: a) two or more conspicuous song posts, b) vegetation suitable for nest-site, and c) presence of singing whitethroat males. Most territories, within which normally all activities took place, were about 1 ha. In the beginning of the breeding season when the vegetation was low, the nests were built on the ground, but later above it. The location of the nests corresponded with the distribution of thorny bushes, nettles and the like (I).

Of 104 clutches, ten were lost during the incubation and five during the nestling period. Of these 15 completely unsuccessful clutches three were abandoned and two were destroyed through the cutting down of the vegetation in which the nests were built. The remaining ten clutches were all destroyed by predators. Besides seven clutches were replaced by cuckoo's young. The clutch-size was on average 4.6 eggs. Approximately 81 % of all laid eggs hatched, and of these 90 % resulted in fledged young, which is an excellent breeding success (II).

ORGANOCHLORINE RESIDUES IN THE WHITETHROAT POPULATION

Whitethroat eggs and young of different ages were collected within the study area and analysed for chlorinated hydrocarbon residues. No spraying for agricultural purposes was performed within the study area in the years (1967 to 1970) when these studies were carried out. All samples analysed contained p,p'-DDT and/or its metabolites p,p'-DDE and p,p'-DDD. The total amount of DDT

decreased in the young during their nestling period and was to a higher extent degraded in older young than in newly hatched young and eggs. This suggested that the food brought to the young did not contain much organochlorine residues. Despite the load of chlorinated hydrocarbon residues the breeding success of the white-throat population was extraordinarily good. No young died during the nestling period and the number of addled eggs was very low (II).

Some whitethroat territories as an experiment were sprayed with DDT in the breeding season of 1970 in a dose which did not exceed that formerly recommended for agricultural purposes. The availability of chlorinated hydrocarbon pesticides within the territories was then measured by sampling the vegetation in which the whitethroats took most of their prey. Samples of insects were taken by one hundred sweeps with a sweep-net within the same territories as the vegetation samples were collected. The insect samples were compared to the stomach contents of whitethroat young and species not found in the stomachs were sorted out before analysis. The whitethroat young were weighed every other day and collected when they were just about to leave their nests. To measure the translocation of the chlorinated hydrocarbon residues when the fat deposits were used, some young were starved for a couple of days after collection.

Samples of vegetation, insects and whitethroat young from sprayed territories contained significantly higher quantities of Σ DDT compared with unsprayed territories. Approximately 3 %, 26 % and 48 %, respectively, of Σ DDT was in the form of metabolites compared to 18 %, 35 % and 75 % in unsprayed territories. The total concentration of DDT in whitethroat young was always higher in breast muscles than in brain tissues. Young starved for a couple of days had higher levels of Σ DDT in both breast muscles and brain tissues than unstarved young. The weight increase of the young reared in sprayed territories was the same as for those in unsprayed territories though the food supply decreased by two-thirds after spraying. Starved young from sprayed territories weighed significantly more at death than the others which may indicate that the former died of a combination of starvation and poisoning while the others died of starvation only (III).

SEASONAL VARIATION OF ORGANOCHLORINE RESIDUES IN SWEDISH WHITE-THROATS

To obtain further information on where and when Swedish white-throats pick up their load of organochlorine residues, whitethroats were caught at Ottenby Bird Station during their spring and autumn migration. Whitethroats caught in the spring when they had just arrived to Sweden had significantly higher concentrations of organochlorine residues compared with whitethroats caught in the autumn just before they were to leave the country. As a comparison whitethroats caught during their spring passage at Capri Bird Station, Italy, had even lower levels of residues than whitethroats caught at Ottenby in the autumn. These findings suggest that white-throats breeding in South Sweden pick up their organochlorine residues during the migrations through Europe rather than in their African winter quarters (V).

EFFECTS OF DDT ON JUVENILE WHITETHROATS

No young died in the whitethroat nests studied in the field, neither during "normal" conditions nor after spraying with DDT in a dose formerly recommended for agricultural purposes (II, III).

The fat deposits stored during the nestling period are used when the juvenile birds begin to move around and try to obtain their own food and then the chlorinated hydrocarbon residues, which are highly lipophilic, are mobilized. It was not feasible to study this in the field because the young are impossible to follow after they have left their nests, and therefore some experiments were carried out in the laboratory.

Juvenile and adult whitethroats were kept in plastic containers and administered meal-worms injected with DDT. Levels of organochlorine residues were after the experiment not higher than those normally found in South Swedish whitethroats. Three juvenile birds, which showed behavioural disturbances, died during the experiment while a fourth was dying when the experiment was discontinued. No adult died. The liver of the juveniles weighed significantly more than that of adults killed three days after administration of DDT but approximately the same as that of adults killed twenty days after administration of DDT. Though no controls neither of juveniles nor of adults are available these findings suggest a faster response to DDT in juvenile than in adult white-throats (IV).

DEGRADATION OF DDT IN WHITETHROATS

Whitethroats kept in the laboratory and administered a certain amount of DDT were used for measuring the degradation rate of p,p'-DDT and excretion of Σ DDT. Degradation of p,p'-DDT was about 15 % higher in birds killed twenty days after administration of the last DDT-injected meal-worm compared to birds killed ten days earlier.

Σ DDT was nearly the same for both groups since, after 20 days, the metabolite p,p'-DDD had increased with approximately the same amount as p,p'-DDT had decreased. This rather rapid degradation of p,p'-DDT provides additional support for the hypothesis that Swedish whitethroats pick up most of their organochlorine residues in Europe (V).

